Lecture Module - Introduction

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

Topic 2 - Types of Variables

Topic 2 - Types of Variables

- Measured Variable
- Independent and Dependent Variables
- Controlled Variables and Parameters
- Extraneous Variables
- Engineering Examples

Measured Variable

"A _____ is an act of assigning a specific value to a physical variable. That physical variable is the measured variable."

Text: Theory and Design of Mech. Meas.

Independent and Dependent Variables

"If a change in one variable will not affect the value of some other variable, the two are considered independent of each other. A variable that can be changed independently of other variables is known as an _____ _____. A variable that is affected by changes in one or more other variables is known as a _____ _____. Normally, the variable that we measure depends on the value of the variables that control the process."

Text: Theory and Design of Mech. Meas.

Controlled Variables and Parameters

"A variable is _____ if it can be held at a constant value or at some prescribed condition during a measurement... ...complete control of a variable is not usually possible. We use the adjective _____ to refer to a variable that can be held as prescribed, at least in a nominal sense...

...we define a _____ as a functional grouping of variables. For example, a moment of inertia or a Reynolds number... ...A _____ that has an effect on the behavior of the measured variable is called a control _____...."

Text: Theory and Design of Mech. Meas.

Extraneous Variables

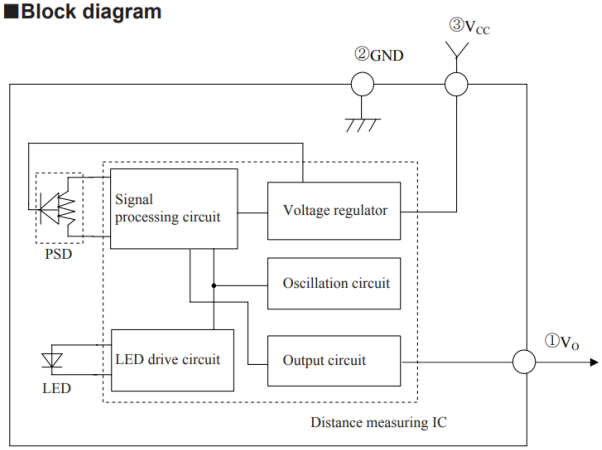
"Variables that are not or cannot be controlled during measurement but that affect the value of the variable measured are called _____ _____. Their influence can confuse the clear relation between cause and effect in a measurement... ...The effects due to _____ _____ can take the form of signals superimposed onto the measured signal with such forms as _____ and drift."

Text: Theory and Design of Mech. Meas.

Engineering Examples

Example 1: SHARP IR Ranger

■Block diagram



Identify the following measurement stages

- Sensor: _____
- Transducer: _____
- Signal Conditioning: _____
- Output: _____

Name at least one for each of the following categories

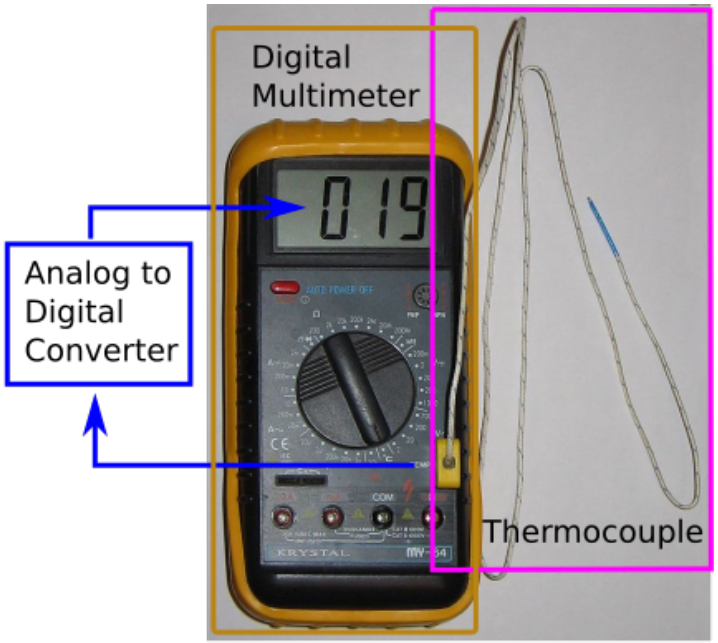
- Measured Variable: _____
- Independent Variable(s): _____
- Dependent Variable(s): _____, _____
- Controlled Variable(s): _____, _____
- Extraneous Variable(s): _____

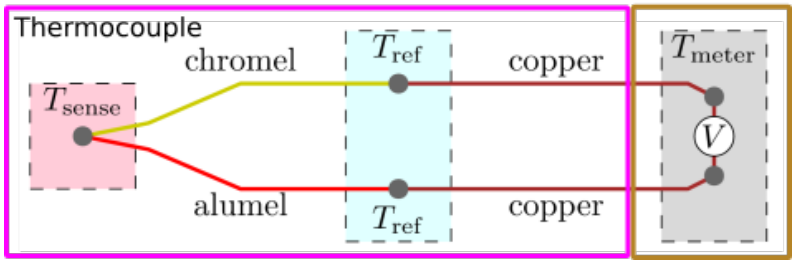
Image, More Info: Wikipedia

Image, More Info: Wikipedia

Engineering Examples

Example 2: Thermocouple with DMM





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- Extraneous Variable(s):_____